

10/539560

JC17 Rec'd PCT/PTO 17 JUN 2005

SEQUENCE LISTING

<110> MITSUI CHEMICALS, INC.

<120> A novel nitrile hydratase

<130> F000286

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/strain="JCM3095"

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Met Thr Glu Asn Ile Leu Arg Lys Ser Asp Glu Glu Ile Gln Lys Glu

5

10

15

Ile Thr Ala Arg Val Lys Ala Leu Glu Ser Met Leu Ile Glu Gln Gly

20 25 30

Ile Leu Thr Thr Ser Met Ile Asp Arg Met Ala Glu Ile Tyr Glu Asn

35 40 45

Glu Val Gly Pro His Leu Gly Ala Lys Val Val Val Lys Ala Trp Thr

50 55 60

Asp Pro Glu Phe Lys Lys Arg Leu Leu Ala Asp Gly Thr Glu Ala Cys

65 70 75 80

Lys Glu Leu Gly Ile Gly Gly Leu Gln Gly Glu Asp Met Met Trp Val

85 90 95

Glu Asn Thr Asp Glu Val His His Val Val Val Cys Thr Leu Cys Ser

100 105 110

Cys Tyr Pro Trp Pro Val Leu Gly Leu Pro Pro Asn Trp Phe Lys Glu

115 120 125

Pro Gln Tyr Arg Ser Arg Val Val Arg Glu Pro Arg Gln Leu Leu Lys

130 135 140

Glu Glu Phe Gly Phe Glu Val Pro Pro Ser Lys Glu Ile Lys Val Trp

145 150 155 160

Asp Ser Ser Ser Glu Met Arg Phe Val Val Leu Pro Gln Arg Pro Ala

165

170

175

Gly Thr Asp Gly Trp Ser Glu Glu Glu Leu Ala Thr Leu Val Thr Arg

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190

Glu Ser Met Ile Gly Val Glu Pro Ala Lys Ala Val Ala

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/strain="JCM3095"

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<223> /gene="nitrile hydratase beta subunit"

/product="nitrile hydratase beta subunit"

<400> 2

Met Asn Gly Val Tyr Asp Val Gly Gly Thr Asp Gly Leu Gly Pro Ile

5

10

15

Asn Arg Pro Ala Asp Glu Pro Val Phe Arg Ala Glu Trp Glu Lys Val

20 25 30

Ala Phe Ala Met Phe Pro Ala Thr Phe Arg Ala Gly Phe Met Gly Leu

35 40 45

Asp Glu Phe Arg Phe Gly Ile Glu Gln Met Asn Pro Ala Glu Tyr Leu

50 55 60

Glu Ser Pro Tyr Tyr Trp His Trp Ile Arg Thr Tyr Ile His His Gly

65 70 75 80

Val Arg Thr Gly Lys Ile Asp Leu Glu Glu Leu Glu Arg Arg Thr Gln

85 90 95

Tyr Tyr Arg Glu Asn Pro Asp Ala Pro Leu Pro Glu His Glu Gln Lys

100 105 110

Pro Glu Leu Ile Glu Phe Val Asn Gln Ala Val Tyr Gly Gly Leu Pro

115 120 125

Ala Ser Arg Glu Val Asp Arg Pro Pro Lys Phe Lys Glu Gly Asp Val

130 135 140

Val Arg Phe Ser Thr Ala Ser Pro Lys Gly His Ala Arg Arg Ala Arg

145 150 155 160

Tyr Val Arg Gly Lys Thr Gly Thr Val Val Lys His His Gly Ala Tyr

165

170

175

Ile Tyr Pro Asp Thr Ala Gly Asn Gly Leu Gly Glu Cys Pro Glu His

180

185

190

Leu Tyr Thr Val Arg Phe Thr Ala Gln Glu Leu Trp Gly Pro Glu Gly

195

200

205

Asp Pro Asn Ser Ser Val Tyr Tyr Asp Cys Trp Glu Pro Tyr Ile Glu

210

215

220

Leu Val Asp Thr Lys Ala Ala Ala Ala

225

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/product="nitrile hydratase alpha subunit"

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gtcaaggccc tggagtcgat gctcatcgaa cagggcatcc tcaccacgtc gatgatcgac 120

cggatggccg agatctacga gaacgaggc tcggccgacc tcggcgccaa ggtcgctgt 180

aaggcctgga ccgaccggc gttcaagaag cgtctgctcg ccgacggcac cgaggcctgc 240

aaggagctcg gcatcgccgg cctgcaggc gaggacatga tgtgggtgga gaacaccgac 300

gaggtccacc acgtcgctgt gtgcacgctc tgctcctgct acccggtggcc ggtgctgggg 360

ctgccgccga actggttcaa ggagccgcag taccgcctcc gcgtgggtc tgagccccgg 420

cagctgctca aggaggagtt cggcttcgag gtcccgccga gcaaggagat caaggcttgg 480

gactccagct ccgagatgcg cttcgctgtc ctcccgccgc gccccgggg caccgacggg 540

tggagcgagg aggagctcgcc acccctcgac acccgcgagt cgtatcgac cgtcgaaaccg 600

gcgaaggcgg tcgctgtga

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/product="nitrile hydratase beta subunit"

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atgaacggcg tgtacgacgt cggcggcacc gatgggctgg gcccgatcaa ccggcccg 60

gacgaaccgg tcttccgcgc cgagtggag aaggtcgctgatgtt cccggcgacg 120

ttccggccg gcttcatggg cctggacgag ttccgggtcg gcatcgagca gatgaacccg 180

gccgagtaacc tcgagtcgcc gtactactgg cactggatcc gcacctacat ccaccacggc 240

gtccgcaccc gcaagatcga tctcgaggag ctggagcgcc gcacgcagta ctaccggag 300

aaccccgacg ccccgctgcc cgagcacgag cagaagccgg agttgatcga gttcgtaac 360

caggccgtct acggcggct gcccgcaga cgggaggtcg accgaccgcc caagttcaag 420

gagggcgacg tggtgcggtt ctccaccgcg agcccgaaagg gccacgccccg gcgcgcgcgg 480

tacgtgcgctg gcaagaccgg gacgggtggtc aagcaccacg ggcgtacat ctacccggac 540

accggccggca acggccctggg cgagtgcccc gagcacctct acaccgtccg cttcacggcc 600

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/product="protein participation in the activation of nitrile

hydratase"

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<222> 1

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Asp Arg Ala Ala Ala Asp Ala Leu Leu Ala Gln Leu Pro Gly Gly Asp
20 25 30

Arg Ala Leu Asp Arg Gly Phe Asp Glu Pro Trp Gln Leu Arg Ala Phe
35 40 45

Ala Leu Ala Val Ala Ala Cys Arg Ala Gly Arg Phe Glu Trp Lys Gln
50 55 60

Leu Gln Gln Ala Leu Ile Ser Ser Ile Gly Glu Trp Glu Arg Thr His
65 70 75 80

Asp Leu Asp Asp Pro Ser Trp Ser Tyr Tyr Glu His Phe Val Ala Ala
85 90 95

Leu Glu Ser Val Leu Gly Glu Glu Gly Ile Val Glu Pro Glu Ala Leu
100 105 110

Asp Glu Arg Thr Ala Glu Val Leu Ala Asn Pro Pro Asn Lys Asp His

115

120

125

His Gly Pro His Leu Glu Pro Val Ala Val His Pro Ala Val Arg Ser

130

135

140

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/product="protein participation in the activation of nitrile hydratase"

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gagccgtggc agctgcgggc gttcgcgctg gcggtcgcgg cgtcagggc gggccggttc 180

gagtggaagc agctgcagca ggcgctgatc tcctcgatcg gggagtggga ggcacccac 240

gatctcgacg atccgagctg gtcctactac gagcacttcg tcgccgcgt ggaatccgtg 300

ctcggcgagg aaggatcg tggatcgag ggcgtggacg agcgcaccgc ggaggcttg 360

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gacgaggccc accacgtc

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<210> 64

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<210> 65

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<210> 66

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<210> 67

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<220>

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18

<210> 68

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<212> DNA

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18

<210> 69

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<210> 70

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atcgagctcg tcaaccag

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<210> 84

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<213> Artificial Sequence

<220>

<223> Oligonucleotide to act as a PCR primer

<400> 84

ggcgccccgcg ccgcaagg

18

<210> 85

<211> 18

<212> DNA

<213> Artificial Sequence

<220>

<223> Oligonucleotide to act as a PCR primer

<400> 85

ggcggggtgtgc ccgcaagc

18

<210> 86

<211> 18

<212> DNA

<213> Artificial Sequence

<220>

<223> Oligonucleotide to act as a PCR primer

<400> 86

ggcgggtcgcc ccgcaagc

18

<210> 87

<211> 18

<212> DNA

<213> Artificial Sequence

<220>

<223> Oligonucleotide to act as a PCR primer

<400> 87

gtggtggtt tctccacc

18

<210> 88

<211> 18

<212> DNA

<213> Artificial Sequence

<220>

<223> Oligonucleotide to act as a PCR primer

<400> 88

cgcgcgtgt acgtgcgc

18

<210> 89

<211> 18

<212> DNA

<213> Artificial Sequence

<220>

<223> Oligonucleotide to act as a PCR primer

<400> 89

cgcgcgtggt acgtgcgc

18

<210> 90

<211> 18

<212> DNA

<213> Artificial Sequence

<220>

<223> Oligonucleotide to act as a PCR primer

<400> 90

aacggcgagg gcgagtgc

18

<210> 91

<211> 18

<212> DNA

<213> Artificial Sequence

<220>

<223> Oligonucleotide to act as a PCR primer

<400> 91

aacggcgatg gcgagtgc

18

<210> 92

<211> 18

<212> DNA

<213> Artificial Sequence

<220>

<223> Oligonucleotide to act as a PCR primer

<400> 92

aacggcaagg gcgagtgc

18

<210> 93

<211> 18

<212> DNA

<213> Artificial Sequence

<220>

<223> Oligonucleotide to act as a PCR primer

<400> 93

aacggccggg gcgagtgc

18

<210> 94

<211> 18

<212> DNA

<213> Artificial Sequence

<220>

<223> Oligonucleotide to act as a PCR primer

<400> 94

aacggcaacg gcgagtgc

18

<210> 95

<211> 18

<212> DNA

<213> Artificial Sequence

<220>

<223> Oligonucleotide to act as a PCR primer

<400> 95

aacggctcg¹⁸ gcgagtg^c

<210> 96

<211> 18

<212> DNA

<213> Artificial Sequence

<220>

<223> Oligonucleotide to act as a PCR primer

<400> 96

aacggcg¹⁸ ggg gcgagtg^c

<210> 97

<211> 18

<212> DNA

<213> Artificial Sequence

<220>

<223> Oligonucleotide to act as a PCR primer

<400> 97

tactacggct gctgggag

18

<210> 98

<211> 205

<212> PRT

<213> Pseudonocardia thermophila

<220>

<221> source

<222> 1..205

<223> /organism="Pseudonocardia thermophila"

/strain="JCM3095"

<220>

<221> CDS

<222> 1..205

<223> /gene="nitrile hydratase alpha subunit"

/product="nitrile hydratase alpha subunit"

<400> 98

Met Thr Glu Asn Ile Leu Arg Lys Ser Asp Glu Glu Ile Gln Lys Glu

5

10

15

Ile Thr Ala Arg Val Lys Ala Leu Glu Ser Met Leu Ile Glu Gln Gly
20 25 30

Ile Leu Thr Thr Ser Met Ile Asp Arg Met Ala Glu Ile Tyr Glu Asn
35 40 45

Glu Val Gly Pro His Leu Gly Ala Lys Val Val Val Lys Ala Trp Thr
50 55 60

Asp Pro Glu Phe Lys Lys Arg Leu Leu Ala Asp Gly Thr Glu Ala Cys
65 70 75 80

Lys Glu Leu Gly Ile Gly Gly Leu Gln Gly Glu Asp Met Met Trp Val
85 90 95

Glu Asn Thr Asp Glu Val His His Val Val Val Cys Thr Leu Cys Ser
100 105 110

Cys Tyr Pro Trp Pro Val Leu Gly Leu Pro Pro Asn Trp Phe Lys Glu
115 120 125

Pro Gln Tyr Arg Ser Arg Val Val Arg Glu Pro Arg Gln Leu Leu Lys
130 135 140

Glu Glu Phe Gly Phe Glu Val Pro Pro Ser Lys Glu Ile Lys Val Trp
145 150 155 160

Asp Ser Ser Ser Glu Met Arg Phe Val Val Leu Pro Gln Arg Pro Ala
165 170 175

Gly Thr Asp Gly Trp Ser Glu Glu Glu Leu Ala Thr Leu Val Thr Arg

180

185

190

Glu Ser Met Ile Gly Val Glu Pro Ala Lys Ala Val Ala

195

200

205

<210> 99

<211> 223

<212> PRT

<213> Pseudonocardia thermophila

<220>

<221> sourse

<222> 1..223

<223> /organism="Pseudonocardia thermophila"

/strain="JCM3095"

<220>

<221> CDS

<222> 1..223

<223> /gene="nitrile hydratase beta subunit"

/product="nitrile hydratase beta subunit"

<400> 99

Met Asn Gly Val Tyr Asp Val Gly Gly Thr Asp Gly Leu Gly Pro Ile

5

10

15

Asn Arg Pro Ala Asp Glu Pro Val Phe Arg Ala Glu Trp Glu Lys Val
20 25 30

Ala Phe Ala Met Phe Pro Ala Thr Phe Arg Ala Gly Phe Met Gly Leu
35 40 45

Asp Glu Phe Arg Phe Gly Ile Glu Gln Met Asn Pro Ala Glu Tyr Leu
50 55 60

Glu Ser Pro Tyr Tyr Trp His Trp Ile Arg Thr Tyr Ile His His Gly
65 70 75 80

Val Arg Thr Gly Lys Ile Asp Leu Glu Glu Leu Glu Arg Arg Thr Gln
85 90 95

Tyr Tyr Arg Glu Asn Pro Asp Ala Pro Leu Pro Glu His Glu Gln Lys
100 105 110

Pro Glu Leu Ile Glu Phe Val Asn Gln Ala Val Tyr Gly Leu Pro
115 120 125

Ala Ser Arg Glu Val Asp Arg Pro Pro Lys Phe Lys Glu Gly Asp Val
130 135 140

Val Arg Phe Ser Thr Ala Ser Pro Lys Gly His Ala Arg Arg Ala Arg
145 150 155 160

Tyr Val Arg Gly Lys Thr Gly Thr Val Val Lys His His Gly Ala Tyr
165 170 175

Ile Tyr Pro Asp Thr Ala Gly Asn Gly Leu Gly Glu Cys Pro Glu His

180

185

190

Leu Tyr Thr Val Arg Phe Thr Ala Gln Glu Leu Trp Gly Pro Glu Gly

195

200

205

Asp Pro Asn Ser Ser Val Tyr Tyr Asp Cys Trp Glu Pro Tyr Ile Glu

210

215

220

Leu Val Asp Thr Lys Ala Ala Ala Ala

225

230

233

<210> 100

<211> 618

<212> DNA

<213> *Pseudonocardia thermophila*

<220>

<221> source

<222> 1..618

<223> /organism="*Pseudonocardia thermophila*"

/strain="JCM3095"

<220>

<221> CDS

<222> 1..618

<223> /gene="nitrile hydratase alpha subunit"

/product="nitrile hydratase alpha subunit"

<400> 100

atgaccgaga acatcctgcg caagtcggac gaggagatcc agaaggagat cacggcgccg 60

gtcaaggccc tggagtgcgt gctcatcgaa cagggcatcc tcaccacgtc gatgatcgac 120

cggatggccg agatctacga gaacgaggc gcgcgcacc tcggcgccaa ggtcgctgtg 180

aaggcctgga ccgaccggc gttcaagaag cgtctgctcg ccgacggcac cgaggcctgc 240

aaggagctcg gcatcgccgg cctgcaggc gaggacatga tgtgggtgga gaacaccgac 300

gaggtccacc acgtcgctgt gtgcacgctc tgctcctgct acccgtggcc ggtgctgggg 360

ctgccgcccga actggttcaa ggagccgcag taccgctccc gcgtggtgcg tgagccccgg 420

cagctgctca aggaggagtt cggcttcgag gtcccgccga gcaaggagat caaggtctgg 480

gactccagct ccgagatgcg cttcgctgac ctcccgccagc gccccgcggg caccgacggg 540

tggagcgagg aggagctcgc caccctcgac acccgcgagt cgatgatcgg cgtcgaaaccg 600

gcgaaggcgg tcgcgtga

618

<210> 101

<211> 702

<212> DNA

<213> Pseudonocardia thermophila

<220>

<221> source

<222> 1..702

<223> /organism="Pseudonocardia thermophila"

/strain="JCM3095"

<220>

<221> CDS

<222> 1..702

<223> /gene="nitrile hydratase beta subunit"

/product="nitrile hydratase beta subunit"

<400> 101

atgaacggcg tgtacgacgt cggcggcacc gatgggtgg gcccgatcaa ccggcccg 60

gacgaaccgg tcttccgcgc cgagtggag aaggtgcgt tcgcgtatgtt cccggcgacg 120

ttccggccg gcttcatggg cctggacgag ttccgggttcg gcatcgagca gatgaacccg 180

gccgagttacc tcgagtgcgc gtactactgg cactggatcc gcacctacat ccaccacggc 240

gtccgcacccg gcaagatcga tctcgaggag ctggagcgcc gcacgcagta ctaccggag 300

aaccccgacg ccccgctgcc cgagcacgag cagaagccgg agttgatcga gttcgtcaac 360

caggccgtct acggcggct gcccgcaga cgggaggatcg accgaccggc caagttcaag 420

gagggcgacg tggtgcggtt ctccaccgcg agcccgaagg gccacgcccg ggcgcgcgg 480

tacgtgcgcg gcaagaccgg gacggtggtc aagcaccacg ggcgtacat ctacccggac 540

accgcccggca acggcctggg cgagtgcggcc gagcacctct acaccgtccg cttcacggcc 600

caggagctgt gggggccgga aggggacccg aactccagcg tctactacga ctgctggag 660

ccctacatcg agctcgtcga cacgaaggcg gccgcggcat ga 702

<210> 102

<211> 144

<212> PRT

<213> Pseudonocardia thermophila

<220>

<221> sourse

<222> 1..144

<223> /organism="Pseudonocardia thermophila"

/strain="JCM3095"

<220>

<221> CDS

<222> 1..144

<223> /gene=" gene encoding protein participation in the activation of
nitrile hydratase"

/product="protein participation in the activation of nitrile
hydratase"

<220>

<221> INT#MET

<222> 1

<400> 102

Met Ser Ala Glu Ala Lys Val Arg Leu Lys His Cys Pro Thr Ala Glu
1 5 10 15

Asp Arg Ala Ala Ala Asp Ala Leu Leu Ala Gln Leu Pro Gly Gly Asp
20 25 30

Arg Ala Leu Asp Arg Gly Phe Asp Glu Pro Trp Gln Leu Arg Ala Phe
35 40 45

Ala Leu Ala Val Ala Ala Cys Arg Ala Gly Arg Phe Glu Trp Lys Gln
50 55 60

Leu Gln Gln Ala Leu Ile Ser Ser Ile Gly Glu Trp Glu Arg Thr His
65 70 75 80

Asp Leu Asp Asp Pro Ser Trp Ser Tyr Tyr Glu His Phe Val Ala Ala
85 90 95

Leu Glu Ser Val Leu Gly Glu Glu Gly Ile Val Glu Pro Glu Ala Leu
100 105 110

Asp Glu Arg Thr Ala Glu Val Leu Ala Asn Pro Pro Asn Lys Asp His

115

120

125

His Gly Pro His Leu Glu Pro Val Ala Val His Pro Ala Val Arg Ser

130

135

140

<210> 103

<211> 435

<212> DNA

<213> Pseudonocardia thermophila

<220>

<221> source

<222> 1..435

<223> /organism="Pseudonocardia thermophila"

/strain="JCM3095"

<220>

<221> CDS

<222> 1..435

<223> /gene="gene encoding protein participation in the activation of nitrile hydratase"

/product="protein participation in the activation of nitrile hydratase"

<220>

<221> init_codon

<222> 1..3

<220>

<221> g or a

<222> 1..1

<400> 103

rtgagcgccg aggcgaaaggc ccgcctgaag cactgccccca cggccgagga ccggcgccg 60

gccgacgcgc tgctcgcgca gctgcccggc ggccgaccgcg cgctcgaccg cggcttcgac 120

gagccgtggc agctgcgggc gttcgcgctg gcggtcgcgg cgtgcagggc gggccggttc 180

gagtggaaagc agctgcagca ggccgtgatc tcctcgatcg gggagtggga ggcacccac 240

gatctcgacg atccgagctg gtcctactac gagcacttcg tcgccgcgt ggaatccgtg 300

ctcgccgagg aaggatcg tggccggag ggcgtggacg agccgcaccgc ggaggcttg 360

cccaacccgc cgaacaagga tcaccatgga ccgcattgg agccgtcgc ggtccacccg 420

cccggtcggt cctga

435

<210> 104

<211> 1315

<212> DNA

<213> Rhodococcus rhodochrous

<220>

<221> sourse

<222> 1.. 1315

<223> /organism="Rhodococcus rhodochrous"

/strain="J1 (FERM BP-1478)"

<220>

<221> CDS

<222> 1.. 690

<223> /gene="nitrile hydratase beta subunit"

/product="nitrile hydratase beta subunit"

<220>

<221> CDS

<222> 704..1315

<223> /gene="nitrile hydratase alpha subunit"

/product="nitrile hydratase alpha subunit"

<400> 104

atg gat ggt atc cac gac aca ggc ggc atg acc gga tac gga ccg gtc

48

Met Asp Gly Ile His Asp Thr Gly Gly Met Thr Gly Tyr Gly Pro Val

1

5

10

15

ccc tat cag aag gac gag ccc ttc ttc cac tac gag tgg gag ggt cgg

96

Pro Tyr Gln Lys Asp Glu Pro Phe Phe His Tyr Glu Trp Glu Gly Arg

20

25

30

acc ctg tca att ctg act tgg atg cat ctc aag ggc ata tcg tgg tgg

144

Thr Leu Ser Ile Leu Thr Trp Met His Leu Lys Gly Ile Ser Trp Trp

35

40

45

gac aag tcg cgg ttc ttc cgg gag tcg atg ggg aac aac tac gtc

192

Asp Lys Ser Arg Phe Phe Arg Glu Ser Met Gly Asn Glu Asn Tyr Val				
50	55	60		
aac gag att cgc aac tcg tac tac acc cac tgg ctg agt gcg gca gaa				240
Asn Glu Ile Arg Asn Ser Tyr Tyr Thr His Trp Leu Ser Ala Ala Glu				
65	70	75	80	
cgt atc ctc gtc gcc gac aag atc atc acc gaa gaa gag cga aag cac				288
Arg Ile Leu Val Ala Asp Lys Ile Ile Thr Glu Glu Glu Arg Lys His				
85	90	95		
cgt gtg caa gag atc ctt gag ggt cgg tac acg gac agg aag ccg tcg				336
Arg Val Gln Glu Ile Leu Glu Gly Arg Tyr Thr Asp Arg Lys Pro Ser				
100	105	110		
cg ^g aag ttc gat ccg gcc cag atc gag aag gc ^g atc gaa cg ^g ctt cac				384
Arg Lys Phe Asp Pro Ala Gln Ile Glu Lys Ala Ile Glu Arg Leu His				
115	120	125		
gag ccc cac tcc cta gc ^g ctt cca gga gc ^g gag cc ^g agt ttc tct ctc				432
Glu Pro His Ser Leu Ala Leu Pro Gly Ala Glu Pro Ser Phe Ser Leu				
130	135	140		
ggt gac aag atc aaa gtg aag agt atg aac cc ^g ctg gga cac aca cc ^g				480
Gly Asp Lys Ile Lys Val Lys Ser Met Asn Pro Leu Gly His Thr Arg				
145	150	155	160	
tgc ccg aaa tat gtg cgg aac aag atc ggg gaa atc gtc gcc tac cac				528
Cys Pro Lys Tyr Val Arg Asn Lys Ile Gly Glu Ile Val Ala Tyr His				

165	170	175	
ggc tgc cag atc tat ccc gag agc agc tcc gcc ggc ctc ggc gac gat 576			
Gly Cys Gln Ile Tyr Pro Glu Ser Ser Ala Gly Leu Gly Asp Asp			
180	185	190	
cct cgc ccg ctc tac acg gtc gcg ttt tcc gcc cag gaa ctg tgg ggc 624			
Pro Arg Pro Leu Tyr Thr Val Ala Phe Ser Ala Gln Glu Leu Trp Gly			
195	200	205	
gac gac gga aac ggg aaa gac gta gtg tgc gtc gat ctc tgg gaa ccg 672			
Asp Asp Gly Asn Gly Lys Asp Val Val Cys Val Asp Leu Trp Glu Pro			
210	215	220	
tac ctg atc tct gcg tga aaggaatacg ata gtg agc gag cac gtc aat 720			
Tyr Leu Ile Ser Ala *** Met Ser Glu His Val Asn			
225	229	1	5
aag tac acg gag tac gag gca cgt acc aag gcg atc gaa acc ttg ctg 768			
Lys Tyr Thr Glu Tyr Glu Ala Arg Thr Lys Ala Ile Glu Thr Leu Leu			
10	15	20	
tac gag cga ggg ctc atc acg ccc gcc gcg gtc gac cga gtc gtt tcg 816			
Tyr Glu Arg Gly Leu Ile Thr Pro Ala Ala Val Asp Arg Val Val Ser			
25	30	35	
tac tac gag aac gag atc ggc ccg atg ggc ggt gcc aag gtc gtg gcc 864			
Tyr Tyr Glu Asn Glu Ile Gly Pro Met Gly Gly Ala Lys Val Val Ala			
40	45	50	

aag tcc tgg gtg gac cct gag tac cgc aag tgg ctc gaa gag gac gcg	912		
Lys Ser Trp Val Asp Pro Glu Tyr Arg Lys Trp Leu Glu Glu Asp Ala			
55	60	65	70
acg gcc gcg atg gcg tca ttg ggc tat gcc ggt gag cag gca cac caa	960		
Thr Ala Ala Met Ala Ser Leu Gly Tyr Ala Gly Glu Gln Ala His Gln			
75	80	85	
att tcg gcg gtc ttc aac gac tcc caa acg cat cac gtg gtg gtg tgc	1008		
Ile Ser Ala Val Phe Asn Asp Ser Gln Thr His His Val Val Val Cys			
90	95	100	
act ctg tgt tcg tgc tat ccg tgg ccg gtg ctt ggt ctc ccg ccc gcc	1056		
Thr Leu Cys Ser Cys Tyr Pro Trp Pro Val Leu Gly Leu Pro Pro Ala			
105	110	115	
tgg tac aag agc atg gag tac cgg tcc cga gtg gta gcg gac cct cgt	1104		
Trp Tyr Lys Ser Met Glu Tyr Arg Ser Arg Val Val Ala Asp Pro Arg			
120	125	130	
gga gtg ctc aag cgc gat ttc ggt ttc gac atc ccc gat gag gtg gag	1152		
Gly Val Leu Lys Arg Asp Phe Gly Phe Asp Ile Pro Asp Glu Val Glu			
135	140	145	150
gtc agg gtt tgg gac agc agc tcc gaa atc cgc tac atc gtc atc ccg	1200		
Val Arg Val Trp Asp Ser Ser Glu Ile Arg Tyr Ile Val Ile Pro			
155	160	165	

gaa cgg ccg gcc ggc acc gac ggt tgg tcc gag gag gag ctg acg aag 1248
Glu Arg Pro Ala Gly Thr Asp Gly Trp Ser Glu Glu Glu Leu Thr Lys

170 175 180

ctg gtg agc cgg gac tcg atg atc ggt gtc agt aat gcg ctc aca ccg 1296
Leu Val Ser Arg Asp Ser Met Ile Gly Val Ser Asn Ala Leu Thr Pro

185 190 195

cag gaa gtg atc gta tga 1315
Gln Glu Val Ile Val ***

200 203

<210> 105

<211> 29

<212> DNA

<213> Artificial Sequence

<220>

<223> Oligonucleotide to act as a PCR primer

<400> 105

ccggaattcg aaaggaatga ggaaatgga 29

<210> 106

<211> 28

<212> DNA

<213> Artificial Sequence

<220>

<223> Oligonucleotide to act as a PCR primer

<400> 106

aaaaagtact catacgatca cttcctgc

28

<210> 107

<211> 17

<212> DNA

<213> Artificial Sequence

<220>

<223> Oligonucleotide to act as a PCR primer

<400> 107

gttttcccaag tcacgac

17

<210> 108

<211> 20

<212> DNA

<213> Artificial Sequence

<220>

<223> Oligonucleotide to act as a PCR primer

<400> 108

ggccagtgcc tagttacat

20

<210> 109

<211> 17

<212> DNA

<213> Artificial Sequence

<220>

<223> Oligonucleotide to act as a PCR primer

<400> 109

cagggaaacag ctagtgcac

17

<210> 110

<211> 29

<212> DNA

<213> Artificial Sequence

<220>

<221> Any

<222> 14..16

<223> Oligonucleotide to act as a PCR primer

<400> 110

ggggcatatcg tggnnnngaca agtgcgcgg

29

<210> 111

<211> 18

<212> DNA

<213> Artificial Sequence

<220>

<221> Any

<222> 7..9

<223> Oligonucleotide to act as a PCR primer

<400> 111

ctcaccnnnt cgatgatc

18

<210> 112

<211> 18

<212> DNA

<213> Artificial Sequence

<220>

<221> Any

<222> 7..9

<223> Oligonucleotide to act as a PCR primer

<400> 112

tacgagnnnng aggtcggc

18

<210> 113

<211> 18

<212> DNA

<213> Artificial Sequence

<220>

<221> Any

<222> 7..9

<223> Oligonucleotide to act as a PCR primer

<400> 113

aagaagnnnnc tgctcgcc

18

<210> 114

<211> 18

<212> DNA

<213> Artificial Sequence

<220>

<221> Any

<222> 7..9

<223> Oligonucleotide to act as a PCR primer

<400> 114

gagttcnnnt tcgaggtc

18

<210> 115

<211> 18

<212> DNA

<213> Artificial Sequence

<220>

<221> Any

<222> 7..9

<223> Oligonucleotide to act as a PCR primer

<400> 115

ctcgccnnnc tcgtcact

18

<210> 116

<211> 18

<212> DNA

<213> Artificial Sequence

<220>

<221> Any

<222> 7..9

<223> Oligonucleotide to act as a PCR primer

<400> 116

aaggcgnnng cgtgagcg

18

<210> 117

<211> 18

<212> DNA

<213> Artificial Sequence

<220>

<221> Any

<222> 7..9

<223> Oligonucleotide to act as a PCR primer

<400> 117

ggcggcnnng atggcgtg

18

<210> 118

<211> 18

<212> DNA

<213> Artificial Sequence

<220>

<221> Any

<222> 7..9

<223> Oligonucleotide to act as a PCR primer

<400> 118

gagaagnnng cgttcgcg

18

<210> 119

<211> 18

<212> DNA

<213> Artificial Sequence

<220>

<221> Any

<222> 7..9

<223> Oligonucleotide to act as a PCR primer

<400> 119

aaggtnnnnt tcgcgatg

18

<210> 120

<211> 18

<212> DNA

<213> Artificial Sequence

<220>

<221> Any

<222> 7..9

<223> Oligonucleotide to act as a PCR primer

<400> 120

gcgatgnnnc cggcgacg

18

<210> 121

<211> 18

<212> DNA

<213> Artificial Sequence

<220>

<221> Any

<222> 7..9

<223> Oligonucleotide to act as a PCR primer

<400> 121

ccggcgnnt tccgggcc

18

<210> 122

<211> 18

<212> DNA

<213> Artificial Sequence

<220>

<221> Any

<222> 7..9

<223> Oligonucleotide to act as a PCR primer

<400> 122

gcgacgnnnnc gggccggc

18

<210> 123

<211> 18

<212> DNA

<213> Artificial Sequence

<220>

<221> Any

<222> 7..9

<223> Oligonucleotide to act as a PCR primer

<400> 123

ggcttcnnng gcctggac

18

<210> 124

<211> 18

<212> DNA

<213> Artificial Sequence

<220>

<221> Any

<222> 7..9

<223> Oligonucleotide to act as a PCR primer

<400> 124

atgggcnnng acgagttc

18

<210> 125

<211> 18

<212> DNA

<213> Artificial Sequence

<220>

<221> Any

<222> 7..9

<223> Oligonucleotide to act as a PCR primer

<400> 125

gacgagnnnnc ggttcggc

18

<210> 126

<211> 18

<212> DNA

<213> Artificial Sequence

<220>

<221> Any

<222> 7..9

<223> Oligonucleotide to act as a PCR primer

<400> 126

aaccggnnng agtaccc

18

<210> 127

<211> 18

<212> DNA

<213> Artificial Sequence

<220>

<221> Any

<222> 7..9

<223> Oligonucleotide to act as a PCR primer

<400> 127

tggcacnnna tccgcacc

18

<210> 128

<211> 18

<212> DNA

<213> Artificial Sequence

<220>

<221> Any

<222> 7..9

<223> Oligonucleotide to act as a PCR primer

<400> 128

gagcagnnnc cggaggttg

18

<210> 129

<211> 18

<212> DNA

<213> Artificial Sequence

<220>

<221> Any

<222> 7..9

<223> Oligonucleotide to act as a PCR primer

<400> 129

atcgagnnng tcaaccag

18

<210> 130

<211> 18

<212> DNA

<213> Artificial Sequence

<220>

<221> Any

<222> 7..9

<223> Oligonucleotide to act as a PCR primer

<400> 130

ggcgggnnnnc ccgcaagc

18

<210> 131

<211> 18

<212> DNA

<213> Artificial Sequence

<220>

<221> Any

<222> 7..9

<223> Oligonucleotide to act as a PCR primer

<400> 131

gtggtggnnt tctccacc

18

<210> 132

<211> 18

<212> DNA

<213> Artificial Sequence

<220>

<221> Any

<222> 7..9

<223> Oligonucleotide to act as a PCR primer

<400> 132

tccaccnnna gcccgaaag

18

<210> 133

<211> 18

<212> DNA

<213> Artificial Sequence

<220>

<221> Any

<222> 7..9

<223> Oligonucleotide to act as a PCR primer

<400> 133

cgcgcgnnt acgtgcgc

18

<210> 134

<211> 18

<212> DNA

<213> Artificial Sequence

<220>

<221> Any

<222> 7..9

<223> Oligonucleotide to act as a PCR primer

<400> 134

accgggnnnng tggtaagg

18

<210> 135

<211> 18

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<213> Artificial Sequence

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<222> 7..9

<223> Oligonucleotide to act as a PCR primer

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18

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<400> 136

ggcgcgnnna tctacccg

18

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<223> Oligonucleotide to act as a PCR primer

<400> 137

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18

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18

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<223> Oligonucleotide to act as a PCR primer

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tacgacnnnt gggagccc

18